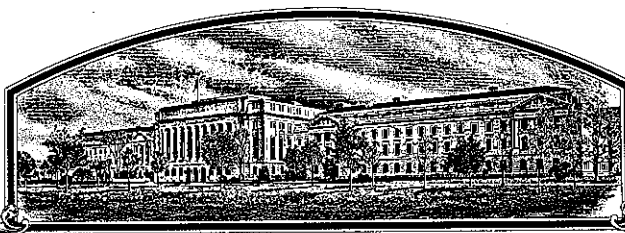


No.

9100155



THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Pioneer Hi-Bred International, Inc.

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED NOVEL VARIETY OF SEXUALLY REPRODUCED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF *eighteen* YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, IMPORTING IT, OR EXPORTING IT, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

ALFALFA

'5311'



In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this 30th day of April in the year of our Lord one thousand nine hundred and ninety-three.

Attest:

Kenneth H. Evans

Commissioner

Plant Variety Protection Office
Agricultural Marketing Service

Ulysses S. Grant
Secretary of Agriculture

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE
(Instructions on reverse)

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF APPLICANT(S) (as it is to appear on the Certificate) Pioneer Hi-Bred International, Inc.		2. TEMPORARY DESIGNATION OR EXPERIMENTAL NO. XAF31	3. VARIETY NAME 5311
4. ADDRESS (street and no. or R.F.D. no., city, state, and ZIP) 7305 N. W. 62nd Avenue, P.O. Box 287 Johnston, IA 50131		5. PHONE (include area code) 515-270-3340	FOR OFFICIAL USE ONLY VPVO NUMBER 9100155 F I L I N G Date March 27, 1991 Time <input type="checkbox"/> A.M. <input type="checkbox"/> P.M. Filing and Examination Fee. \$ 2150. ⁰⁰ Date March 27, 1991 Certificate Fee: \$ 250. ⁰⁰ Date Apr. 15, 1993
6. GENUS AND SPECIES NAME Medicago sativa	7. FAMILY NAME (Botanical) Leguminosae		
8. CROP KIND NAME (Common Name) Alfalfa	9. DATE OF DETERMINATION August, 1980		
10. IF THE APPLICANT NAMED IS NOT A "PERSON," GIVE FORM OF ORGANIZATION (Corporation, partnership, association, etc.) Corporation			
11. IF INCORPORATED, GIVE STATE OF INCORPORATION Iowa		12. DATE OF INCORPORATION 1926	

13. NAME AND ADDRESS OF APPLICANT REPRESENTATIVE(S), IF ANY, TO SERVE IN THIS APPLICATION AND RECEIVE ALL PAPERS

William T. W. Woodward, 7305 N. W. 62nd Avenue, P. O. Box 287, Johnston, IA 50131
Mary Helen Mitchell, 700 Capital Square, 400 Locust Street, Des Moines, IA 50309
John Hintze, 700 Capital Square, 400 Locust Street, Des Moines, IA 50309

PHONE (include area code):

14. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED (Follow INSTRUCTIONS on reverse)

- a. ☒ Exhibit A, Origin and Breeding History of the Variety.
b. ☒ Exhibit B, Novelty Statement.
c. ☒ Exhibit C, Objective Description of Variety.
d. ☒ Exhibit D, Additional Description of Variety.
e. ☒ Exhibit E, Statement of the Basis of Applicant's Ownership.
f. ☒ Seed Sample (2,500 viable untreated seeds) Date Seed Sample mailed to Plant Variety Protection Office March 13, 1991
g. ☒ Filing and Examination Fee (\$2,150) made payable to "Treasurer of the United States."

15. DOES THE APPLICANT(S) SPECIFY THAT SEED OF THIS VARIETY BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED? (See section 83(a) of the Plant Variety Protection Act.)
☐ YES (If "YES," answer items 16 and 17 below) ☒ NO (If "NO," skip to item 18 below)

16. DOES THE APPLICANT(S) SPECIFY THAT THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS?
☒ YES ☐ NO

17. IF "YES" TO ITEM 16, WHICH CLASSES OF PRODUCTION BEYOND BREEDER SEED?
☒ FOUNDATION ☐ REGISTERED ☒ CERTIFIED

18. DID THE APPLICANT(S) PREVIOUSLY FILE FOR PROTECTION OF THE VARIETY IN THE U.S.?

- ☐ YES (If "YES," through ☐ Plant Variety Protection Act ☐ Patent Act Give date: _____)
☒ NO

19. HAS THE VARIETY BEEN RELEASED, USED, OFFERED FOR SALE, OR MARKETING IN THE U.S. OR OTHER COUNTRIES?

- ☒ YES (If "YES," give names of countries and dates) Canada Spring of 1991
☐ NO

20. The applicant(s) declare(s) that a viable sample of basic seeds of this variety will be furnished with the application and will be replenished upon request in accordance with such regulations as may be applicable.

The undersigned applicant(s) is (are) the owner(s) of this sexually reproduced novel plant variety, and believe(s) that the variety is distinct, uniform, and stable as required in section 41, and is entitled to protection under the provisions of section 42 of the Plant Variety Protection Act. Applicant(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.

SIGNATURE OF APPLICANT [Owner(s)] PIONEER HI-BRED INTERNATIONAL, INC.	CAPACITY OR TITLE	DATE
SIGNATURE OF APPLICANT [Owner(s)] BY <i>William T. W. Woodward</i>	Director, Department of Alfalfa Breeding	3-12-91

EXHIBIT A
ORIGIN AND BREEDING HISTORY OF THE VARIETY
'5311'

5311 is a 24 clone synthetic cultivar with parental clones replicated in "cage isolation". Seed harvested from each clone and bulked in 1980 is considered breeder seed (syn 1). Parental clones were selected for one or more of the following: Seed yield, bacterial wilt, spotted alfalfa aphid and Phytophthora root rot. Parents trace through several intermediate experimental lines to: 545 (13%), Agate (13%), Vernal (10%), Culver (10%), Atra 55 (3%), Cherokee (2%), Dawson (2%); 520, 521, Conquest, Iroquois, Narragansett, MSA-C4, MSB W-4, Ramsey, MSB-C4, Flemish, Kayseri (38%), with 9% unknown. In addition, parental clones were evaluated for forage yield and pest resistance using OP progeny tests at several locations.

During seed multiplication no variates beyond the limits defined under Exhibit C have been found. Multiplication procedures will insure that seed being sold as 5311 will not be shifted in characteristics beyond presently acceptable limits for alfalfa varieties.

It is confirmed that 5311 meets presently acceptable levels for uniformity for alfalfa varieties.

EXHIBIT B

NOVELTY STATEMENT

'5311'

5311 most closely resembles '5472'. 5311 differs from 5472 in anthracnose resistance and dormancy, being classified as susceptible to anthracnose and a dormancy similar to Ranger, while 5472 has moderate resistance to anthracnose and a dormancy similar to Saranac.

U.S. DEPARTMENT OF AGRICULTURE
 AGRICULTURAL MARKETING SERVICE
 LIVESTOCK, MEAT, GRAIN & SEED DIVISION
 PLANT VARIETY PROTECTION OFFICE
 BELTSVILLE, MARYLAND 20705

FORM 1-77
 (APR 77)

OBJECTIVE DESCRIPTION OF VARIETY
 ALFALFA (*Medicago sativa* sensu Gunn et al.)

NAME OF APPLICANT(S) Pioneer Hi-Bred International, Inc.	TEMPORARY DESIGNATION XAF31	VARIETY NAME 5311
ADDRESS (Street and No., or R.F.D. No., City, State, and Zip Code) 7305 N. W. 62nd Avenue, P. O. Box 287 Johnston, IA 50131		FOR OFFICIAL USE ONLY PVPO NUMBER 9100155

PLEASE READ ALL INSTRUCTIONS CAREFULLY: Place numbers in the boxes to designate the expressions which are characteristic of the commercial generations of the application variety. Data for quantitative plant characters should be based on a minimum of 100 plants. Include leading zeros when necessary (e.g.,) for quantitative data. Comparative data should be determined from varieties entered in the same trial. Plant color may be precisely designated by using any recognized color chart, e.g., The Munsell Plant Tissue Color Charts.

1. WINTERHARDINESS:

CLASS:

- | | |
|--|--------------------------------------|
| 1 = Very Non-Winterhardy (CUF 101) | 2 = Non-Winterhardy (Moapa 69) |
| 3 = Intermediately Non-Winterhardy (Mesilla) | 4 = Semi-Winterhardy (Lahontan) |
| 5 = (Du Puits) | 6 = Moderately Winterhardy (Saranac) |
| 7 = (Ranger) | 8 = Winterhardy (Vernal) |
| 9 = Extremely Winterhardy (Norseman) | |

TEST LOCATION: Owatonna, MN

2. FALL DORMANCY:

FALL DORMANCY (DETERMINED FROM SPACED PLANTINGS)

TESTING INSTITUTION AND LOCATION	DATE OF LAST CUT	DATE REGROWTH SCORED	REGROWTH SCORE OR AVERAGE HEIGHT				LSD .05
			APPLICATION VARIETY	CHECK VARIETIES*			
				Vernal	Ranger	Saranac	
Pioneer Hi-Bred International, Inc. Owatonna, MN	9/1/84	10/3/84	8.6	7.9	8.6	9.1	0.76

* CUF 101, Moapa 69, Mesilla, Lahontan, Du Puits, Saranac, Ranger, Vernal, or Norseman as appropriate.

Specify scoring system used: Average height in cm of space plants

Fall Growth Habit (Determined from Fall Dormancy Trials)

- | | | |
|----------------------------|--------------------------|----------------------------|
| 1 = Erect (CUF 101) | 3 = Semierect (Mesilla) | 5 = Intermediate (Saranac) |
| 7 = Semidecumbent (Vernal) | 9 = Decumbent (Norseman) | |

3. RECOVERY AFTER FIRST SPRING CUT (In Southwest, first cut after March 21):

- | | | | |
|--------------------------|--------------------|---------------------------|-------------------|
| 1 = Very Fast (CUF 101) | 3 = Fast (Saranac) | 5 = Intermediate (Ranger) | 7 = Slow (Vernal) |
| 9 = Very Slow (Norseman) | | | |

TEST LOCATION: Owatonna, MN

4. AREAS OF ADAPTATION IN U.S. (Where tested and proven adapted):

Primary Area of Adaptation

Other Areas of Adaptation

- | | | |
|--|-------------------------------|------------------|
| 1 = North Central | 2 = East Central | 3 = Southeast |
| 5 = Moderately Winterhardy Intermountain | 6 = Winterhardy Intermountain | 7 = Great Plains |
| 8 = Other (Specify) _____ | | |



5. FLOWERING DATE (When 10% of plants possess open flowers at time of first spring cut):

Days Earlier Than

Same As

Days Later Than

1 = CUF 101

2 = Mesilla

3 = Saranac

4 = Vernal

5 = Norseman

TEST LOCATION: _____

6. PLANT COLOR (Determined from healthy regrowth 3 weeks after first spring cut, consulting feather color if necessary):

☐

1 = Very Dark Green (524)

2 = Dark Green (Vernal)

3 = Light Green (Ranger)

COLOR CHART VALUE (Specify chart used): _____

APPLICATION VARIETY: _____

VERNAL: _____

TEST LOCATION: _____

7. CROWN TYPE (Determined from spaced plantings):

☐

Noncreeping Types:

1 = Broad (Vernal)

2 = Intermediate (Saranac)

3 = Narrow (CUF 101)

Creeping Types:

4 = Creeping Rooted (Rangelander)

5 = Rhizomatous (Rhizoma)

8. FLOWER COLOR (Determine frequency of plants for each color class as defined by USDA Agricultural Handbook No. 424 (Barnes 1972), allowing all plants in plot to flower):

% Purple and Violet (Subclasses 1.1 to 1.4)

% Blue (Subclasses 2.3 and 2.4)

% Variegated Other Than Blue (Subclasses 2.1, 2.2, 2.5 to 2.9)

% Yellow (Subclasses 4.1 to 4.4)

% Cream (Class 3)

% White (Class 5)

TEST LOCATION: Johnston, IA, 1990

9. POD SHAPE (Determine frequency of plants with the following pod shapes produced on well cross-pollinated racemes):

% Tightly Coiled (One or more coils, center more or less closed)

% Loosely Coiled (One or more coils, center conspicuously open)

% Sickle (Less than 1 coil)

TEST LOCATION: _____

10. PEST RESISTANCE: Provide in the appropriate column, trial data for application variety, and resistant (R) and susceptible (S) check varieties, synthetic generation tested, average severity index scores (ASI), least significant difference statistics (LSD .05), the institution in charge of test, year, and location of test, and whether test is a field or laboratory evaluation. Describe scoring system, and any test procedure which differs from standard methods proposed by Elgin (1982). Trial data from other test years or locations should be presented whenever available on a separate document as Exhibit D. Seeds of the check varieties and germplasm lines listed below can be obtained from the USDA Field Crops Laboratory, Bldg. 001, Rm. 335, BARC-West, Beltsville, MD 20705. Although comparisons with check varieties listed below are preferred, comparisons with any appropriate check variety recommended by Elgin (1982) may be presented.

A. DISEASE RESISTANCE:	DISEASE	VARIETY	SYN. GEN. TESTED	PERCENT RESISTANT PLANTS	NUMBER OF PLANTS TESTED	ASI	ASI LSD .05	INSTITUTION, YEAR, LOCATION, FIELD OR LABORATORY
Anthracnose, Race 1 (<i>Colletotrichum trifolii</i>)	Application	S	2	0.2	Approx 300		Percent Resistant Plants 6.9	Pioneer Hi-Bred International, Inc. 1984 Johnston, IA Laboratory
	Arc (R)			65.0	"			
	Saranac (S)			0.0	"			
	SCORING SYSTEM: Percent surviving seedlings							
Anthracnose, Race 2 (<i>Collectotrichum trifolii</i>)	Application							
	Saranac AR (R)							
	Arc (S)							
	SCORING SYSTEM:							
Bacterial Wilt (<i>Corynebacterium insidiosum</i>)	Application	HR	1	69.5	Approx 225	1.58	0.41	University of Minnesota 1984 Rosemount, MN Field
	Vernal (R)			42.0	"	1.99		
	Narragansett (S)			3.5	"	3.28		
	SCORING SYSTEM: Plants scored 0 and 1 (on a 0-5 scale, where 0=no disease and 5=dead plant) considered resistant. Data adjusted to Vernal at 42% resistant plants by the University of Minnesota.							
Common Leafspot (<i>Pseudopeziza medicaginis</i>)	Application							
	MSA-CW3AN3 (R)							
	Ranger (S)							
	SCORING SYSTEM:							

10. A. PEST RESISTANCE (Continued):

DISEASE	VARIETY	SYN. GEN. TESTED	PERCENT RESISTANT PLANTS	NUMBER OF PLANTS TESTED	ASI	ASI LSD .05	INSTITUTION, YEAR, LOCATION, FIELD OR LABORATORY
Downy Mildew (<i>Peronospora trifoliorum</i>)	Application						9100155
Isolate, if known:	Saranac (R)						
	Kanza (S)						
	SCORING SYSTEM:						
Fusarium Wilt (<i>Fusarium oxysporum</i> f. <i>medicaginis</i>)	Application HR	1	64.3	Approx 225	1.8	0.44	University of Minnesota 1984 Rosemount, MN Field
	XXXXXX Agate (R)		54.0	"	2.3		
	Narragansett (S)		24.2	"	3.6		
	MNGN-1 (S)		5.1	"	4.7		
	SCORING SYSTEM: Plants scored 0 and 1 (on a 0-5 scale, where 0=no disease and 5=dead plant) considered resistant. Data adjusted to Agate at 54% resistant						
Phytophthora Root Rot (<i>Phytophthora megasperma</i> f. <i>medicaginis</i>)	Application R	1	45.8	Approx 225	4.19	0.61	University of Minnesota 1984 St. Paul, MN Field
	Agate (R)		43.0	"	4.28		
	Saranac (S)		1.4	"	5.72		
	SCORING SYSTEM: Plants scored 1 and 2 (on a 1-6 scale, where 1=no disease and 6=dead plant) considered resistant. Data adjusted to Agate at 43% resistant						
Verticillium Wilt (<i>Verticillium albo-atrum</i>)	Application MR	2	24.0	Approx 200	2.87	ASI 0.74 Percent Resistant Plants 18.6	Pioneer Hi-Bred International, Inc. 1988 Arlington, WI Laboratory
	Vertus (R)		41.0	"	4.17		
	XXXXXX Vernal (S)		4.6	"	2.10		
	SCORING SYSTEM: Plants scored 7-9 (on a 1-9 scale, where 9=no disease and 1=dead plant) considered resistant. Data adjusted to Vertus at 41% resistant						
Other (Specify)	by Pioneer Hi-Bred International, Inc.						
	(R)						
	(S)						
	SCORING SYSTEM:						
Other (Specify)	Application						
	(R)						
	(S)						
	SCORING SYSTEM:						
B. INSECT RESISTANCE:	VARIETY	SYN. GEN. TESTED	PERCENT DEFOLIATION	DEFOLIATION IN PERCENT OF RESISTANT CHECK	ASI	ASI LSD .05	INSTITUTION, YEAR, LOCATION, FIELD OR LABORATORY
INSECT							
Afalla Weevil (<i>Hypena postica</i>)	Application						
	Arc (R)			100			
	Saranac (S)						
	SCORING SYSTEM:						

19. B. INSECT RESISTANCE (Continued):

INSECT	VARIETY	SYN. GEN. TESTED	PERCENT SEEDLING SURVIVAL	NUMBER OF SEEDLINGS TESTED	ASI	ASI LSD .05	INSTITUTION, YEAR, LOCATION, FIELD OR LABORATORY
Blue Alfalfa Aphid (<i>Acyrtosiphon kondoi</i>)	Application						
	CUF 101 (R)						
	PA-1 (S)						
	SCORING SYSTEM:						
Pea Aphid (<i>Acyrtosiphon pisum</i>)	Application HR	1	107.0	Approx 250		Percent Resistant Plants 27.8	Pioneer Hi-Bred International, Inc. 1984 Kerman, CA Laboratory
	Baker (R)		70.0	"			
	Kanza (R) Kanza (R)		65.4	"			
	Ranger (S)		11.7	"			
SCORING SYSTEM: Plants scored 7-9 (on a 1-9 scale, where 9=no symptoms and 1=dead plant or severe stunting) considered resistant. Data adjusted to Baker at 70% resistant plants by Pioneer Hi-Bred International, Inc.							
Spotted Alfalfa Aphid (<i>Therioaphis maculata</i>) Biotype, if known:	Application R	2	54.9	Approx 250	2.9	ASI 0.91 Percent Resistant Plants 31.1	Pioneer Hi-Bred International, Inc. 1988 Kerman, CA Laboratory
	Kanza (R)		70.0	"	2.9		
	Ranger (S)		22.6	"	1.8		
	SCORING SYSTEM: Plants scored 7-9 (on a 1-9 scale, where 9=no symptoms and 1=dead plant or severe stunting) considered resistant. Data adjusted to Kanza at 70% resistant plants by Pioneer Hi-Bred International, Inc.						
INSECT	VARIETY	SYN. GEN. TESTED	PERCENT RESISTANT PLANTS	NUMBER OF PLANTS TESTED	ASI	ASI LSD .05	INSTITUTION, YEAR, LOCATION, FIELD OR LABORATORY
Potato Leafhopper Yellowing (<i>Empoasca fabae</i>)	Application						
	MSA-CW3An3 (R)						
	Ranger (S)						
	SCORING SYSTEM:						
Other (Specify)	Application						
	(R)						
	(S)						
	SCORING SYSTEM:						
C. NEMATODE RESISTANCE:							
NEMATODE	VARIETY	SYN. GEN. TESTED	PERCENT RESISTANT PLANTS	NUMBER OF PLANTS TESTED	ASI	ASI LSD .05	INSTITUTION, YEAR, LOCATION, FIELD OR LABORATORY
Northern Root Knot (<i>Meloidogyne hapla</i>)	Application						
	Nev. Syn. XX (R)						
	Lahontan (S)						
	SCORING SYSTEM:						

10. C. NEMATODE RESISTANCE (Continued):

NEMATODE	VARIETY	SYN. GEN. TESTED	PERCENT RESISTANT PLANTS	NUMBER OF PLANTS TESTED	ASI	ASI LSD .05	INSTITUTION, YEAR, LOCATION, FIELD OR LABORATORY
Southern Root Knot (<i>Metoidogyne incognita</i>)	Application						
	Moapa 69 (R)						
	Lahontan (S)						
	SCORING SYSTEM:						
Stem Nematode (<i>Ditylenchus dipsaci</i>)	Application MR	2	31.4	Approx 200	3.33	ASI 0.78 Percent Resistant Plants 23.7	Pioneer Hi-Bred International, Inc. 1989 Connell, WA Laboratory
	Lahontan (R)		50.0	"	3.50		
	Ranger (S)		15.2	"	3.06		
	SCORING SYSTEM: Plants scored 7-9 (on a 1-9 scale, where 9=no symptoms and 1=dead plant) considered resistant. Data adjusted to Lahontan at 50% resistant plants by Pioneer Hi-Bred International, Inc.						
Other (Specify)	Application						
	(R)						
	(S)						
SCORING SYSTEM:							

11. INDICATE THE VARIETY THAT MOST CLOSELY RESEMBLES THE APPLICATION VARIETY FOR EACH OF THE FOLLOWING CHARACTERS:

CHARACTER	VARIETY	CHARACTER	VARIETY
Winterhardiness	Ranger	Plant Color	—
Recovery After 1st Cut	Ranger	Crown Type	—
Area of Adaptation	5364	Combined Disease Resistance	5472
Flowering Date	—	Combined Insect Resistance	5373

REFERENCES

Barnes, D.K. 1972. A System for Visually Classifying Alfalfa Flower Color. U.S. Dep. Agric. Handb. 424. 18 pp. (Note: Greenish cast of plate 6, A and B is an artifact of printing, actual colors a blend of yellow and white.)

Elgin, J.H., Jr., (ed.). 1982. Standard Tests to Characterize Pest Resistance in Alfalfa Cultivars. U.S. Dep. Agric. Tech. Bull. (In Press).

Gunn, C.R., W.H. Skrdla, and H.C. Spencer. 1978. Classification of Medicago sativa L. using legume characters and flower colors. U.S. Dep. Agric. Tech. Bull. 1574. 84 pp.

Munsell Color Co. 1977. Munsell Plant Tissue Color Charts. Munsell Color Co., Inc. Baltimore.

NOTE: Any additional descriptive information and supporting documentation may be provided as Exhibit D.

APPLICATION FOR REVIEW OF ALFALFA VARIETIES FOR CERTIFICATION
National Alfalfa Variety Review Board

(The criteria for evaluation of applications were developed by the Joint Alfalfa Work conference and the Association of Official Seed Certifying Agencies.)

Applicant's Name: Pioneer Hi-Bred International, Inc. Date: April 18, 1990
 Address: P. O. Box 287, Johnston, IA 50131

Sponsoring Institution (if other than applicant):

Breeder's NAME (IF OTHER THAN APPLICANT):

VARIETY NAME: 5311 EXPERIMENTAL DESIGNATION: XAF31, YAF31, 80P-1, 80P-2

APPLICANT'S SIGNATURE: William T. Woodward

The breeder or sponsoring institution or organization must describe and DOCUMENT in this application those characteristics of the variety which give it distinctiveness and merit by supplying the information requested below. Information must be supplied for each category excepting those listed as optional. Action will be deferred unless the application is sufficiently documented.

At the time a variety is accepted for certification, a seed sample of the generation or generations requested by the certifying agency shall be submitted to the certifying agency by the sponsor. This lot(s) is to be retained as a control sample against which all future seed stocks released for certified seed production may be compared to establish continued trueness of variety.

- I. A. Estimate the % of the germplasm sources listed below that contribute to the major genetic constitution of this variety.

<u>M.FALCATA</u>	<u>LADAK</u>	<u>M.VARIA</u>	<u>TURKISTAN</u>	<u>FLEMISH</u>	<u>CHILEAN</u>
7	20	47	7	1	8
<u>PERUVIAN</u>	<u>INDIAN</u>	<u>AFRICAN</u>	<u>ARABIAN</u>	<u>UNKNOWN</u>	
1	0	0	0	9	

- B. A statement of origin (including variety names, germplasm releases and/or PI numbers, and the number of plants or % contribution from each) and the breeding procedures or methods and selection criteria used in developing the variety. Include the procedure for producing breeder seed, the generation (e.g. syn 1, syn 2, etc.) that is considered breeder seed, and the year of breeder seed production.

5311 is a 24 clone synthetic cultivar with parental clones replicated in "cage isolation". Seed harvested from each clone and bulked in 1980 is considered breeder seed (syn 1). Parental clones were selected for one or more of the following: Seed yield, bacterial wilt, spotted alfalfa aphid and Phytophthora root rot. Parents trace through several intermediate experimental lines to: 545 (13%), Agate (13%), Vernal (10%), Culver (10%), Atra 55 (3%), Cherokee (2%), Dawson (2%); 520, 521, Conquest, Iroquois, Narragansett, MSA-C4, MSB W-4, Ramsey, MSB-C4, Flemish, Kayseri (38%), with 9% unknown. In addition, parental clones were evaluated for forage yield and pest resistance using OP progeny tests at several locations.

- C. Seed classes to be used, limitations on age of stand and areas of production for each class.

Seed Class	Synthetic Generation	Length of Stand Allowed	Limitation on Areas for Seed Production
Breeder	1	One	None
Foundation	2 or 3	Three	None
Certified	3 or 4	Five	None

Only the synthetic generations given for the above seed classes are recognized as representing this variety. (No supporting data should be used in this application from syn. generations other than those for the Breeder, Foundation and Certified Classes listed here).

- D. Procedures for maintaining seed stock:

Breeder seed (syn 1) produced on 24 parents in cage isolation over a 1 year period was bulked. Seed classes will be breeder, foundation and certified. Foundation seed may be produced from breeder or foundation. The second generation foundation seed may be produced at the discretion of Pioneer Hi-Bred International, Inc. Both breeder and foundation seed will be maintained by Pioneer Hi-Bred International, Inc. Certified seed may be produced from breeder or foundation seed.

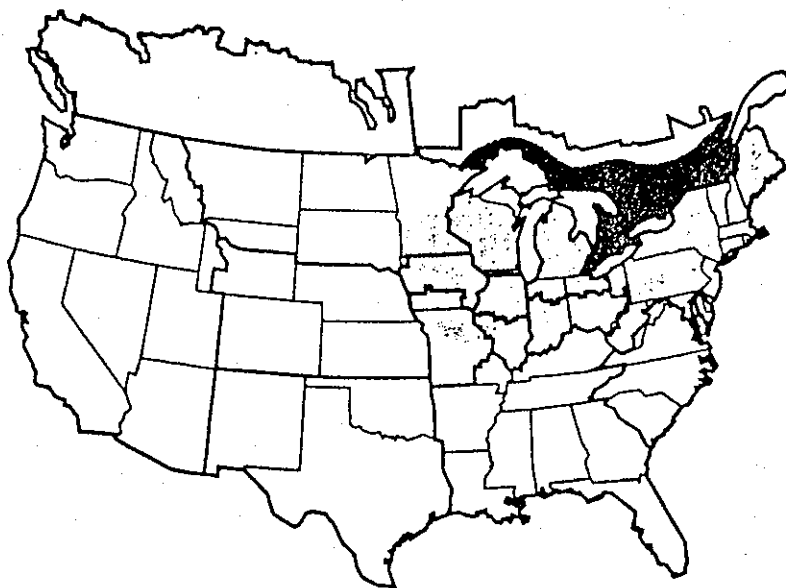
- E. Any other requirements or limitations necessary to maintain varietal characteristics?

None

- II. A. Describe the primary use of this variety (if for uses other than hay, haylage, greenchop or dehydration):
- B. List states and areas within states where tested for forage and/or persistence. (present data from each location in III.A. and III.B.)

Johnston, IA; Toledo, IA; Owatonna, MN; Tipton, IN; Litchfield, MI; Marlette, MI; Rome, NY; Phelps, NY; Lancaster, PA; Lewisburg, PA; Buckeystown, MD; Hermiston, OR; Connell, WA; Moses Lake, WA; Davis, IL; Arlington, WI; Yuba, WI; Edgar, WI.

- C. Indicate proposed areas of adaptation and intended use on the map below.



III. Evidence of agronomic performance, including data on yield (in T/A) and persistence. Data may be from tests conducted by private firms, Agricultural Experiment Stations or USDA.

- A. Minimum required forage yield data is six location years with at least two locations (two locations must be at least 100 miles apart). Seeding year forage yield data cannot be used to satisfy this requirement. One location must have at least two harvest years beyond seeding year. Each harvest year should be listed separately.

Note: For non-dormant varieties (dormancy level of Moapa 69 or CUF 101) seeding year data may be accepted for up to two of the six location years when four or more cuttings are made in the seeding year.

Summarize forage yield data below:

Test Location	Date Plntd Mo/Yr	Syn Gen	Year Hvst	No. Cuts	Test Variety	Total Yield (DM T/A)		LSD .05	CV%
						2.Vernal	3. 526		
Johnston IA	4/81	1	1982	4	5.77	5.38	5.99	0.59	7.5%
	4/81	1	1983	4	5.99	5.14	6.10	0.59	7.4%
Johnston IA	4/82	1	1983	4	5.94	5.03	5.24	0.64	8.5%
	4/82	1	1984	4	5.51	5.02	5.08	0.61	8.0%
Johnston IA	4/83	1	1984	4	7.92	6.26	7.06	0.89	7.5%
	4/83	1	1985	4	7.70	6.62	7.49	0.56	4.7%
Johnston IA	4/84	1	1985	4	7.92	6.81	7.84	0.73	6.0%
	4/84	1	1986	4	6.47	5.94	6.34	0.57	5.3%
Tipton IN	4/81	1	1982	3	3.42	3.07	3.49	0.36	7.9%
	4/81	1	1983	3	3.82	3.38	3.74	0.31	6.1%
Tipton IN	4/82	1	1983	4	6.44	5.56	6.50	0.48	5.5%
	4/82	1	1984	4	8.11	7.02	7.96	0.44	4.0%
Tipton IN	4/83	1	1984	4	7.58	7.20	7.65	0.66	5.3%
	4/83	1	1985	4	6.96	6.39	7.38	0.37	3.2%
Tipton IN	4/84	1	1985	4	6.63	6.23	6.90	0.65	5.9%
	4/84	1	1986	3	3.76	3.42	3.80	0.47	7.5%
Yuba WI	4/81	1	1982	3	4.81	4.18	4.36	0.51	8.1%
	4/81	1	1983	4	7.22	6.08	7.09	0.69	7.3%
Yuba WI	4/82	1	1983	4	7.83	7.60	7.37	0.71	6.6%
	4/82	1	1984	3	5.94	5.55	5.72	0.60	7.6%
Yuba WI	4/83	1	1984	3	5.51	5.15	5.20	0.79	9.3%
Owatonna MN	5/81	1	1982	3	5.81	5.30	6.21	0.48	5.9%
	5/81	1	1983	3	5.04	4.27	5.86	0.59	8.7%
Owatonna MN	5/82	1	1983	3	4.95	4.37	5.38	0.77	11.2%
	5/82	1	1984	3	5.66	4.64	5.25	0.50	7.0%
Owatonna MN	5/83	1	1984	3	5.38	4.82	5.99	0.59	6.4%
	5/83	1	1985	4	6.44	5.46	7.09	0.82	7.7%
Owatonna MN	5/84	1	1985	4	5.88	5.21	5.66	0.79	8.5%
	5/84	1	1986	4	7.28	5.27	6.11	0.76	7.2%
Hermiston OR	4/84	1	1985	5	12.34	11.50	12.71	1.11	5.6%
	4/84	1	1986	5	12.25	11.52	12.37	0.97	4.8%

Test Location	Date Plntd Mo/Yr	Syn Gen	Year Hvst	No. Cuts	Test Variety	Total Yield (DM T/A)		LSD .05	CV%
						2.Vernal	3. 526		
Toledo IA	4/81	1	1982	3	5.41	4.84	5.05	0.36	4.9%
	4/81	1	1983	4	6.31	5.63	6.44	0.49	5.5%
Toledo IA	4/82	1	1983	4	5.98	5.18	5.81	0.42	5.2%
	4/82	1	1984	4	5.89	4.86	5.62	0.83	10.9%
Toledo IA	4/83	1	1984	4	6.11	5.86	6.93	0.72	6.9%
	4/83	1	1985	4	6.48	6.14	7.09	0.93	8.3%
Toledo IA	4/84	1	1985	4	7.45	6.33	7.60	0.80	6.5%
	4/84	1	1986	4	6.21	5.10	6.33	0.55	5.5%
Rome NY	4/82	1	1983	2	3.22	3.51	3.58	0.69	15.1%
	4/82	1	1984	3	3.13	2.67	3.53	0.49	11.2%
Phelps NY	4/83	1	1984	2	5.41	4.99	5.20	0.73	8.6%
	4/83	1	1985	4	8.30	8.05	8.55	1.01	7.4%
Phelps NY	4/84	1	1985	4	6.25	5.19	6.20	0.45	4.6%
	4/84	1	1986	4	7.45	6.06	7.59	0.61	5.1%
Connell WA	4/83	1	1984	3	6.86	6.86	7.15	0.73	6.1%
	4/83	1	1985	5	11.23	10.25	9.92	0.95	5.3%
Connell WA	4/84	1	1985	5	12.25	10.78	12.13	0.96	4.8%
	4/84	1	1986	5	11.92	10.03	11.92	0.75	3.9%
Lancaster PA	4/81	1	1982	4	5.93	4.41	3.63	0.63	9.0%
	4/81	1	1983	4	6.69	5.63	5.69	0.47	5.3%
Lancaster PA	4/82	1	1983	4	7.65	6.75	7.65	0.85	8.1%
	4/82	1	1984	4	6.29	4.72	5.75	0.54	6.3%
Lancaster PA	4/83	1	1984	4	6.98	5.99	7.19	0.56	4.9%
	4/83	1	1985	4	6.84	5.48	6.64	0.82	7.7%
Lancaster PA	4/84	1	1985	4	5.80	5.31	5.98	0.77	7.7%
	4/84	1	1986	4	5.38	4.72	5.33	0.84	9.2%
Lewisburg PA	4/81	1	1982	2	2.47	2.23	2.28	0.37	11.1%
	4/81	1	1983	3	3.41	2.86	3.38	0.72	15.6%
Lewisburg PA	4/82	1	1983	3	3.35	3.38	3.80	0.46	9.4%
	4/82	1	1984	3	5.99	5.19	6.16	0.67	8.3%
Buckeystown PA	4/83	1	1984	4	7.54	6.99	7.85	0.93	7.2%
	4/83	1	1985	5	7.87	6.81	8.61	0.81	6.0%
Buckeystown PA	4/84	1	1985	5	6.78	5.52	6.45	0.84	7.7%
	4/84	1	1986	4	5.40	4.40	4.30	0.96	11.7%

Test Location	Date Plntd Mo/Yr	Syn Gen	Year Hvst	No. Cuts	Test Variety	Total Yield (DM T/A)		LSD .05	CV%
						2.Vernal	3. 526		
Moses Lake WA	4/83	1	1984	2	4.05	3.28	4.09	0.42	6.3%
Moses Lake WA	4/84	1	1985	4	10.61	9.35	10.40	0.93	5.4%
	4/84	1	1986	4	12.15	10.04	10.70	1.01	5.5%
Davis IL	4/81	1	1982	4	6.81	6.19	6.67	0.80	8.1%
	4/81	1	1983	4	5.89	5.18	6.19	0.61	7.2%
Davis IL	4/82	1	1983	3	5.97	5.10	5.86	0.44	5.4%
	4/82	1	1984	4	8.32	7.39	8.15	0.66	5.6%
Davis IL	4/83	1	1984	4	8.48	7.17	8.39	0.84	6.2%
Davis IL	4/84	1	1985	4	7.60	6.85	7.60	0.70	5.7%
	4/84	1	1986	3	8.03	7.25	7.96	0.60	4.7%
Edgar WI	4/81	1	1982	2	3.61	2.99	3.15	0.41	9.0%
Edgar WI	4/83	1	1984	3	5.53	5.47	6.27	0.72	7.6%
Arlington WI	4/84	1	1985	5	8.55	6.53	8.25	1.14	9.3%
	4/84	1	1986	4	6.53	5.20	6.17	0.77	7.8%
Litchfield MI	4/81	1	1982	3	6.24	5.46	6.12	0.45	5.3%
	4/81	1	1983	4	7.47	6.37	7.19	0.42	4.4%
Litchfield MI	4/82	1	1983	4	6.60	5.78	6.03	0.67	7.4%
	4/82	1	1984	4	6.13	5.36	6.01	0.44	5.2%
Litchfield MI	4/83	1	1984	4	5.20	4.89	5.20	0.40	4.8%
	4/83	1	1985	3	3.94	3.39	4.02	0.43	6.7%
Litchfield MI	4/84	1	1985	3	3.00	3.04	3.50	0.73	13.5%
	4/84	1	1986	4	7.68	6.99	7.83	0.53	4.2%
Marlette MI	5/81	1	1982	3	5.19	4.21	4.85	0.47	6.8%
	5/81	1	1983	4	7.85	6.64	7.55	0.63	5.9%
Marlette MI	5/82	1	1983	4	8.12	7.13	8.61	0.59	5.1%
	5/82	1	1984	4	6.93	5.28	6.53	0.69	7.4%
Marlette MI	5/83	1	1984	4	7.17	6.60	7.81	0.87	7.4%
	5/83	1	1985	3	4.31	3.92	4.96	0.94	13.1%
Marlette MI	5/84	1	1985	3	3.20	3.27	3.80	0.91	15.5%
	5/84	1	1986	4	6.62	6.08	6.89	0.84	7.6%

Mean Annual Yield

	Years Hvstd	Total No. of Hvsts		
CK 2 Comparison	95	352	6.53	5.73
CK 3 Comparison	95	352	6.53	6.47

SEE ATTACHMENT A FOR ONTARIO, CANADA, DATA

B. Persistence (winter and drought tolerance, summer survival relative to check varieties). Enter dates of both Initial and Final stand estimates. Data must come from the area of adaptation and from stands at least two years old. More than one location must be given either when persistence is a trait used to justify release or when large diverse geographic areas of adaptation are recommended.

Test Location	Syn Gen	Date Seeded Mo/Yr	Yrs. Hvtd	No. Hvts	Date of Readings Int/Fnl	Test Variety Inl/Fnl	% Stand Check Varieties		LSD .05	CV%
							Vernal Inl/Fnl	526 Inl/Fnl		
Johnston, IA	1	4/82	3	10	6-82/10-84	99/93	98/87	99/89	4.53	3.5
Toledo, IA	1	4/82	3	8	6-82/10-84	99/91	98/77	99/90	8.16	6.7
Watonna, MN	1	5/82	3	10	7-82/10-84	100/90	98/85	99/85	11.37	9.4
Tipton, IN	1	4/82	3	10	6-82/10-84	99/95	95/87	95/92	3.81	2.9
Litchfield, MI	1	4/82	3	10	6-82/10-84	98/97	96/92	96/94	4.43	3.3
Marlette, MI	1	5/82	3	10	7-82/10-84	98/95	93/90	98/94	2.68	2.0
Rome, NY	1	4/82	3	8	6-83/10-84	98/84	91/68	93/83	7.39	6.5
Lancaster, PA	1	4/82	3	10	6-83/10-84	94/83	83/56	98/79	10.26	9.4
Lewisburg, PA	1	4/82	3	8	6-83/10-84	89/83	82/77	82/79	9.19	8.1
Yuba, WI	1	4/82	3	9	6-82/10-84	99/90	98/92	98/86	7.62	6.2
Davis, IL	1	4/82	3	9	6-82/10-84	96/87	92/77	93/76	5.52	4.7

Scoring System Used: Missing six inch units within each plot converted to % stand using a plot size of 120 units.

C. Fall dormancy relative to recognized varieties; check varieties must be chosen so as to bracket the dormancy data of this variety.

1. Test Data

Test Location	Syn Gen	Date Last Cut	Date Measured	Score or average height				LSD .05	CV%
				Test Variety	Check varieties				
					Vernal	Ranger	Saranac		
OWATONNA MN	1	9/1/81	10/1/81	25.4	24.0	25.8	25.7	2.1	8.0
OWATONNA MN	1	9/1/82	10/4/82	24.8	24.7	25.6	27.6	1.6	6.4
OWATONNA MN	1	9/1/84	10/3/84	8.6	7.9	8.6	9.1	0.76	7.5

Scoring system used: Average height in cm of space plants; 25 plants each rep with 8 replications.

WINTER SURVIVALTest conducted by Pioneer Hi-Bred International, Inc., at Owatonna, MN

Variety	Class	Year Tested	Syn Gen	Percent Survival
Test variety	Hardy	1981-82	1	48.1%
Ranger	Hardy			39.6%
526	Hardy			66.5%
Vernal	Hardy			77.3%
Saranac	Moderately Hardy			31.3%
555	Low Hardy			12.0%
LSD (.05)				14.1%
CV (%)				34.0%

Scoring system used: Plots seeded in 25' rows with 8 replications. Plots were hand thinned to leave plants spaced 1' apart (25 plants per/plot). Date of last harvest 10/1/81 with surviving plants counted the following spring.

WINTER SURVIVALTest conducted by Pioneer Hi-Bred International, Inc., at Owatonna, MN

Variety	Class	Year Tested	Syn Gen	Percent Survival
Test variety	Hardy	1982-83	1	40.5%
Vernal	Hardy			66.8%
Ranger	Hardy			42.0%
Saranac	Moderately hardy			29.0%
5444	Moderately hardy			25.6%
555	Low hardy			13.6%
LSD (.05)				12.6%
CV (%)				36.0%

Scoring system used: Plots seeded in 25' rows with 8 replications. Plots were hand thinned to leave plants spaced 1' apart (25 plants per/plot). Date of last harvest 10/4/82 with surviving plants counted the following spring.

WINTER SURVIVALTest conducted by Pioneer Hi-Bred International, Inc., at Owatonna, MN

Variety	Class	Year Tested	Syn Gen	Percent Survival
Test variety	Hardy	1984-85	1	37.2%
Vernal	Hardy			58.9%
Ranger	Hardy			33.7%
526	Hardy			41.6%
Saranac	Moderately Hardy			15.0%
5444	Moderately Hardy			21.4%
555	Low Hardy			4.9%
LSD (.05)				12.6%
CV (%)				35.7%

Scoring system used: Plots seeded in 25' rows with 8 replications. Plots were hand thinned to leave plants spaced 1' apart (25 plants per/plot). Date of last harvest 10/3/84 with surviving plants counted the following spring.

2. Indicate which of the following check varieties this variety most nearly compares to in fall dormancy.

VERY DORMANT	DORMANT	MOD. DORMANT	NON-DORMANT	VERY NON-DORMANT
Norseman ()	Vernal () Ranger (X)	Saranac () DuPuits () Lahontan ()	Mesilla () Moapa 69 ()	CUF 101 ()

D. Seed production (this information optional)

Variety	Syn Gen	Test Location	Yrs. Tested	Average Yield (lbs/A)
Test variety				
1.		No information		
2.				

IV. Other descriptive characteristics

- A. Flower color at full bloom. Syn generation observed 3 (see USDA Agr. Handbook No. 424 - A system for visually classifying alfalfa flower color).

98 % purple t % cream 1 % yellow
1 % variegated t % white

- B. Growth habit: (erect, semi-erect or decumbent)

Mid summer Erect
 Fall Semi-erect

- C. Optional: (Document distinctive characteristics such as pod, leaf or root traits, biochemical markers, etc.)

V. Pest Resistance Characteristics

PLEASE FOLLOW THESE INSTRUCTIONS CAREFULLY WHEN REPORTING PEST RESISTANCE RESULTS.

Furnish comparative data on the following insects and diseases (and others where applicable) for your variety. Data may be from tests conducted by private firms, Agricultural Experiment Stations, or USDA. Tests should be conducted by standard procedures as described in ARS Misc. publication 1434. Each disease and insect test must include recognized resistant and susceptible checks. Statistics must include the test mean (mean of all entries in test), LSD (.05), and CV (%). Resistance levels should be characterized using % resistant plants as follows: S=<6%, LR=6-14%, MR=15-30%, R=31-50%, HR=>50%. Do not refer to tolerance. Checks should be characterized based on long term % resistance averages published in ARS Misc. publication 1434. If data for the resistant check does not fit its expected resistance class (MR, R, HR, etc.) data must be adjusted to the long term mean. If data has been adjusted, supply both adjusted and unadjusted values and indicate how and by whom the adjustment was made.

At the time a variety is accepted for certification, a seed sample of the generation or generations requested by the certifying agency shall be submitted to the certifying agency by the sponsor. This lot(s) is to be retained as a control sample against which all future seed stocks released for certified seed production may be compared to establish continued trueness of variety.

If a scoring or rating system is used, specify the limits and meaning of scores. NOTE: If a pest reaction of the variety falls on or just above a resistance category level (+2% for LR, MR, and R; +3% for HR) and the higher rating is claimed, results of a second test must be reported. If the two tests do not agree, the lower rating is appropriate unless further testing supports the higher rating. Pest resistance data must be submitted on at least six of the following nine pests: anthracnose, bacterial wilt, Fusarium wilt, Verticillium wilt, Phytophthora root rot, stem nematode, pea aphid, spotted alfalfa aphid, and blue alfalfa aphid. For the pests where no data is available write "Not tested". The six required pests must be selected from those that frequently cause significant losses on susceptible cultivars in the area of proposed adaptation of this variety. (Use the map you have shaded in IIC and compare with the maps of distribution and severity of alfalfa pests in ARS Misc. publication 1434. This will determine for which pests you must submit resistance information.) Show generation of seed used for each test.

ANTHRACNOSE (Race 1)

Test conducted by _____ at _____

Variety	Resistance Class	Year Tested	Syn Gen	Unadjust. % Resist.	Adjust. % Resist.	Score or A.S.I.
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Test Variety _____ Not tested

- 1.
- 2.
- 3.

Test Mean:
L.S.D. (.05)
C.V. (%)

Scoring system used: _____

BACTERIAL WILTTest conducted by University of Minnesota at Rosemount, MN

Variety	Resistance Class	Year Tested	Syn Gen	Unadjust. % Resist.	Adjust. % Resist.	Score or A.S.I.
Test Variety	HR	1984	1	58.7	69.5	1.58
1. Vernal	R			35.5	42.0	1.99
2. Narragansett	S			3.0	3.5	3.28
3.						
	Test Mean:			32.43		2.23
	L.S.D. (.05)			21.30		0.41
	C.V. (%)			33.40		11.40

Scoring system used: Plants scored 0 and 1 (on a 0-5 scale, where 0=no disease and 5=dead plant) considered resistant. Data adjusted to Vernal at 42% resistant plants by the University of Minnesota.

FUSARIUM WILTTest conducted by University of Minnesota at Rosemount, MN

Variety	Resistance Class	Year Tested	Syn Gen	Unadjust. % Resist.	Adjust. % Resist.	Score or A.S.I.
Test Variety	HR	1984	1	68.3	64.3	1.8
1. Agate	R			57.4	54.0	2.3
2. MNGN-1	S			5.4	5.1	4.7
3. Narragansett	MR			25.7	24.2	3.6
	Test Mean:			53.08		2.44
	L.S.D. (.05)			11.90		0.44
	C.V. (%)			13.80		11.20

Scoring system used: Plants scored 0 and 1 (on a 0-5 scale, where 0=no disease, and 5=dead plant) considered resistant. Data adjusted to agate at 54% resistant plants by the University of Minnesota.

VERTICILLIUM WILT

Test conducted by Pioneer Hi-Bred International, Inc. at Arlington, WI

Variety	Resistance Class	Year Tested	Syn Gen	Unadjust. % Resist.	Adjust. % Resist.	Score or A.S.I.
Test Variety	MR	1988	2	12.0	24.0	2.87
1. Vertus	R			20.5	41.0	4.17
2. Vernal	S			2.3	4.6	2.10
Test Mean:				14.5	29.0	3.30
L.S.D. (.05)				9.3	18.6	0.74
C.V. (%)				48.0	48.0	17.00

Scoring system used: Plants scored 7-9 (on a 1-9 scale, where 9=no disease and 1=dead plant) considered resistant. Data adjusted to Vertus at 41% resistant plants by Pioneer Hi-Bred International, Inc.

PHYTOPHTHORA ROOT ROT

Test conducted by University of Minnesota at St. Paul, MN

Variety	Resistance Class	Year Tested	Syn Gen	Unadjust. % Resist.	Adjust. % Resist.	Score or A.S.I.
Test variety	R	1984	1	17.7	45.8	4.19
1. Agate	R			16.6	43.0	4.28
2. Saranac	S			0.5	1.4	5.72
3.						
Test Mean:				12.22		4.61
L.S.D. (.05)				10.11		0.61
C.V. (%)				75.70		11.70

Scoring system used: Plants scored 1 and 2 (on a 1-6 scale, where 1=no disease, and 6=dead plant) considered resistant. Data adjusted to Agate at 43% resistant plants by University of Minnesota.

PHYTOPHTHORA ROOT ROTTest conducted by Pioneer Hi-Bred International, Inc. at Johnston, IA

Variety	Resistance Class	Year Tested	Syn Gen	Unadjust. % Resist.	Adjust. % Resist.	Score or A.S.I.
Test Variety	R	1986	2	33.9	58.7	4.7
1. Agate	R			24.8	43.0	4.6
2. Saranac	S			0.0	0.0	3.0
3.						
Test Mean:				19.7	34.2	4.5
L.S.D. (.05)				21.6	37.4	1.1
C.V. (%)				68.0	68.0	15.0

Scoring system used: Plants scored 7-9 (on a 1-9 scale, where 9=no disease, and 1=dead plant) considered resistant. Data adjusted to Agate at 43% resistant plants by Pioneer Hi-Bred International, Inc.

STEM NEMATODETest conducted by Pioneer Hi-Bred International, Inc. at Connell, WA

Variety	Resistance Class	Year Tested	Syn Gen	Unadjust. % Resist.	Adjust. % Resist.	Score or A.S.I.
Test Variety	MR	1989	2	9.2	31.4	3.33
1. Lahontan	R			14.7	50.0	3.50
2. Ranger	S			4.5	15.2	3.06
3. Vernal	S			4.2	14.2	3.10
Test Mean:				9.1	30.9	2.90
L.S.D. (.05)				6.9	23.7	0.78
C.V. (%)				55.0	55.0	19.00

Scoring system used: Plants scored 7-9 (on a 1-9 scale, where 9=no symptoms and 1=dead plant) considered resistant. Data adjusted to Lahontan at 50% resistant plants by Pioneer Hi-Bred International, Inc.

PEA APHID

Test conducted by Pioneer Hi-Bred International, Inc. at Kerman, CA

Variety	Resistance Class	Year Tested	Syn Gen	Unadjust. % Resist.	Adjust. % Resist.	Score or A.S.I.
Test Variety	HR	1984	1	57.8	107.0	
1. Baker	R			37.8	70.0	
2. Kanza	R			35.3	65.4	
3. Ranger	S			6.3	11.7	
4. Vernal	S			2.8	5.2	
Test Mean:				39.0	72.2	
L.S.D. (.05)				15.0	27.8	
C.V. (%)				27.3	27.3	

Scoring system used: Plants scored 7-9 (on a 1-9 scale, where 9=no symptoms and 1=dead plant or severe stunting) considered resistant. Data adjusted to Baker at 70% resistant plants by Pioneer Hi-Bred International, Inc.

SPOTTED ALFALFA APHID

Test conducted by Pioneer Hi-Bred International, Inc. at Fresno, CA

Variety	Resistance Class	Year Tested	Syn Gen	Unadjust. % Resist.	Adjust. % Resist.	Score or A.S.I.
Test Variety	R	1988	2	23.3	54.9	2.9
1. Baker	R			32.0	75.4	3.2
2. Kanza	R			29.7	70.0	2.9
3. Ranger	S			9.6	22.6	1.8
Test Mean:				23.3	54.9	2.60
L.S.D. (.05)				13.2	31.1	0.91
C.V. (%)				35.0	35.0	21.00

Scoring system used: Plants scored 7-9 (on a 1-9 scale, where 9=no symptoms, and 1=dead or severe stunting) considered resistant. Data adjusted to Kanza at 70% resistant plants by Pioneer Hi-Bred International, Inc.

BLUE ALFALFA APHID

Test conducted by _____ at _____

Variety	Resistance Class	Year Tested	Syn Gen	Unadjust. % Resist.	Adjust. % Resist.	Score or A.S.I.
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Test Variety

Not tested

1.
2.
3.

Test Mean:

L.S.D. (.05)

C.V. (%)

Scoring system used: _____

Please attach a one page description/summary of your variety as you wish it published by AOSCA. This description must stand on its own. Please use complete sentences.

Include the following:

1. A statement of genetic origin (including variety names, germplasm releases, and/or PI numbers that contributed to the major genetic constitution of this variety) and the breeding procedures, methods, and selection criteria used in developing the variety. Estimate the % of the major germplasm sources contributing to this cultivar (see I.A.)
2. Area of probable adaptation (geographic area) and primary purpose (hay, grazing, etc.) for which this variety will be used. Report states where the variety has been tested for yield and persistence and proposed areas of intended use.
3. Other descriptive characteristics such as flower color, fall dormancy, and other morphological or physiological identifying traits.
4. A statement relative to its resistance to anthracnose, bacterial wilt, Fusarium wilt, Verticillium wilt, Phytophthora root rot, stem nematode, pea aphid, spotted alfalfa aphid, and blue alfalfa aphid.
5. Procedures for maintaining seed stock, seed classes to be used, a statement as to the limitation of age of stand and generations that may be certified and other requirements or limitations necessary to maintain varietal characteristics.
6. If this variety is accepted by official certifying agencies, when will certified seed first be offered for sale?
7. Will application be made for protection under the Plant Variety Protection Act and if so, will the certification option be requested?
8. As a means of added varietal protection, are you willing to have the information in this application turned over to the PVP office?

1. 5311 is a 24 clone synthetic with parental clones replicated in "cage isolation". Seed harvested from each clone and bulked in 1980 is considered breeder seed (Syn 1). Parental clones were selected for one or more of the following: Seed yield, bacterial wilt, spotted alfalfa aphid and Phytophthora root rot. Parents trace through several intermediate experimental lines to: 545, Agate, Vernal, Culver, Atra 55, Cherokee, Dawson, 520, 521, Conquest, Iroquois, Narragansett, MSA-C4, MSB W-4, Ramsey, MSB-C4, Flemish, Kayseri and others with small contributions. In addition, parental clones were evaluated for forage yield and pest resistance using OP progeny tests at several locations. Germplasm sources are: M. falcata (7%), Ladak (20%), M. varia (47%), Turkistan (7%), Flemish (1%), Chilean (8%), Peruvian (1%), and 9% unknown.
2. 5311 is adapted to and recommended for use in the northern regions of the U. S. A. and southeast regions of Canada for hay, haylage, greenchop and dehydration. The states in which 5311 have been tested are: Iowa, Minnesota, Indiana, Michigan, New York, Pennsylvania, Maryland, Oregon, Washington, Illinois and Wisconsin. It has also been tested in the Province of Ontario, Canada. The variety has been tested using the following experimental designations: XAF31, YAF31, 80P-1 and 80P-2.
3. 5311 has a fall dormancy and winterhardiness similar to Ranger. Flower color of the Syn 3 generation is approximately 98% purple, 1% variegated, 1% yellow and a trace of cream and white. Growth habit is erect in mid summer and semi-erect in the fall.
4. 5311 has high resistance to bacterial wilt, Fusarium wilt and pea aphid; resistance to Phytophthora root rot and spotted alfalfa aphid; moderate resistance to stem nematode and Verticillium wilt. Resistance to anthracnose and blue alfalfa aphid has not been adequately determined.
5. Breeder seed (Syn 1) was produced on parent plants in "cage isolation" and bulked. Seed classes will be breeder, foundation (Syn 2 or Syn 3), and certified (Syn 3 or Syn 4). Foundation seed may be produced from breeder or foundation. The second generation foundation seed may be produced at the discretion of Pioneer Hi-Bred International, Inc. Limitation on age of stand for producing breeder, foundation, and certified seed will be one, three and five years, respectively. Sufficient breeder and foundation seed for the projected life of the variety will be maintained by Pioneer Hi-Bred International, Inc.
6. Seed will be marketed in the spring of 1991.
7. Application for Plant Variety Protection will be made and the certification option will not be requested.
8. As a means of added varietal protection, information included in the Application for Review of Alfalfa Varieties for Certification may be provided to the PVP office.

ATTACHMENT A
ONTARIO, CANADA, YIELD DATA

5311

1985 ENTRIES, IROQUOIS TYPE. PROVINCE MEANS
CHECKS: 120 IROQUOIS

CULTIVAR	TOTAL STATION YEARS			YIELDS AS % OF CHECK		
	TOTAL	1ST YEAR	2ND YEAR	TOTAL	1ST YEAR	2ND YEAR
NY8412	16	12	4	101	100	104
BIG TEN	11	8	3	98	99	97
SURE	11	8	3	102	102	102
SHIELD	11	8	3	100	100	100
CROWN	11	8	3	102	102	100
CENTURION	11	8	3	100	100	100
LSC 537	11	8	3	100	100	103
5311	11	8	3	104	103	105
OT84-2	11	8	3	96	96	96
SF8001	11	8	3	97	96	100

1985 ENTRIES, IROQUOIS TYPE. PROVINCE MEANS
CHECKS: 120 IROQUOIS

CULTIVAR	ENTRY MEANS/KG/HA			CHECK MEANS KG/HA		
	TOTAL	1ST YEAR	2ND YEAR	TOTAL	1ST YEAR	2ND YEAR
NY8412	11305	11839	9704	11152	11789	9243
BIG TEN	10375	11042	8596	10485	11120	8792
SURE	10759	11408	9030	10485	11120	8792
SHIELD	10499	11135	8801	10485	11120	8792
CROWN	10731	11435	8853	10485	11120	8792
CENTURION	10547	11178	8863	10485	11120	8792
LSC 537	10578	11145	9067	10485	11120	8792
5311	10937	11549	9304	10485	11120	8792
OT8402	10148	10777	8470	10485	11120	8792
SF8001	10254	10781	8849	10485	11120	8792

1985 ENTRIES, IROQUOIS-TYPE FALL DORMANCY, YIELDS KG/HA

LOCATION	S.YR	H.YR	120	IROQUOIS	5311
RIDGETOWN	1985	1986	13844	13409	13926
KEMPTVILLE	1985	1986	13948	12770	13531
THUNDER BAY	1985	1986	5452	4877	5401
RIDGETOWN	1985	1987	6227	6811	6277
RIDGETOWN	1986	1987	13245	12699	13517
GUELPH	1986	1987	15807	15834	16807
KEMPTVILLE	1986	1987	8311	8622	9322
OTTAWA	1986	1987	11018	10607	11594
NEW LISKEARD	1986	1987	8330	9153	8292
GUELPH	1986	1988	10517	11184	11969
NEW LISKEARD	1986	1988	9522	8988	9666

EXHIBIT E

STATEMENT OF THE BASIS OF APPLICANT'S OWNERSHIP

'5311'

Pioneer Hi-Bred International, Inc., Des Moines, Iowa, is the employer of the plant breeders involved in the development and evaluation of 5311. Pioneer Hi-Bred International, Inc. has the sole rights and ownership of 5311.